

Artificial Intelligence

Joint class 5314 / 4320

Midterm 1

(take-home, due by midnight on Wednesday March, 22)

1 Artificial Intelligence: general topic (Total: 20 points)

Exercise 1 (20 points) *If you were a judge in the Loebner contest, what questions would you ask to determine whether you were communicating with a computer or a human? (propose 3 questions) Justify your choices.*

Suggest some possible some possible answers that a program might give to tricky questions that would seem human-like, but which avoid answering the question.

2 Knowledge representation and inference (Total: 15 points)

Exercise 2 (15 points) *The following IF-THEN rules are proposed for a simple rule-based financial advice expert system:*

R1: IF NOT savings_adequate THEN ADD invest_savings

R2: IF savings_adequate AND income_adequate THEN ADD invest_stocks

R3: IF NOT has_children THEN ADD savings_adequate

R4: IF married AND spouse_has_job THEN ADD income_adequate

- 1. Outline how the hypothesis invest_stocks could be proved through backward chaining. Assume that current facts include: has_children, married and spouse_has_job.*
- 2. In the current state of rules R1 through R4, we can have the following situations:*
 - If you are married and your spouse works, then the system is going to conclude that your income is adequate... even if your spouse has a very low income, and you have 15 children to support.*
 - If you don't have children, the system is going to conclude that your savings are adequate, even if you don't have any, and want to buy a house.*
 - Finally the system ignores the fact that if you have a really huge income, then these may be adequate, even if you have children and your spouse does not work.*

Extend the rule set to deal with these issues.

3 Expert systems (Total: 10 points)

Exercise 3 (Total: 10 points) *Develop a simple set of rules for diagnosing respiratory system diseases, given patient symptoms, using the following knowledge of typical symptoms.*

- **Influenza:** *symptoms include a persistent dry cough and a feeling of general malaise.*
- **Hayfever:** *symptoms include a runny nose and sneezing. The patient will show a positive reaction to allergens, such as dust or pollen.*
- **Laryngitis:** *symptoms include a fever, a dry cough, and a feeling of general malaise. A “laryngoscopy” will reveal that the person has an inflamed larynx.*
- **Asthma:** *symptoms include breathlessness and wheezing. If it is triggered by an allergen, such as dust or pollen, it is likely to be “extrinsic asthma”. “Intrinsic asthma” tends to be triggered by exercise, smoke or respiratory infection.*

4 AI projects (Total: 10 points)

Exercise 4 (10 points) *You are working on a project in AI, but you have to learn from the other projects. In this exercise, you have to pick a project (among the seven other ones) and:*

1. *describe it:*
 - (a) *present the problem that is to be solved in this project;*
 - (b) *explain why this is an interesting problem;*
 - (c) *describe the techniques that need to be implemented to solve this problem;*
2. *compare it to your own project:*
 - (a) *how related / not related it is to your project, and why;*
 - (b) *what you could learn from working on this other project that could contribute to yours.*

Within your team, you have to decide who picks what other project, so that no two person within a team describes the same other project.